# CDM-570 & CDM-570L Satellite Modems

## INTRODUCTION

Ideal for optimizing satellite communications, the CDM-570 and the CDM-570L are designed to meet the needs of low-cost terminals with 70/140 MHz interfaces to conventional Up & Down Converters, or L-Band interfaces to Low Noise Block Converters (LNBs) and Block Up Converters (BUCs).

The modems include synchronous EIA-530/-422, V.35, EIA-232 and G.703 interfaces. In addition, an optional Internet Protocol (IP) Module is available with a 10/100 Base-T Ethernet interface for LAN and network applications.

The architecture is firmware and FPGA-based, and the internal Flash memory allows easy updating via the serial port, or front panel USB port. The modem offers exceptional flexibility and cost-effective performance in a 1RU enclosure.

## FEATURES

- CDM-570: 50 to 90 or 100 to 180 MHz IF range
  CDM-570L: 950 to 1950 MHz IF range
- Fast acquisition demodulator (± 32 kHz acquisition range, 64 kbps, Rate 1/2 QPSK: 150 ms average)
- Modulation types: BPSK, QPSK, OQPSK, 8-PSK, 8-QAM, 16-QAM
- Data rate range from 2.4 kbps to 5 Mbps
- Forward Error Correction choices include Turbo Product Coding, Viterbi, Reed-Solomon, and TCM
- Automatic Uplink Power Control (AUPC)
- Embedded Distant-end Monitor and Control (EDMAC)
- Asymmetric Loop Timing
- Built-in 1:1 redundancy controller (Y-cables for data, simple and inexpensive external module for IF and RF)
- CDM-570: FSK communications to CSAT-5060 or KST-2000A
- CDM-570L: Operation with LNB and BUC
- CDM-570L: BUC 10 MHz reference and FSK communications and optional BUC power supplies
- CDM-570L: LNB Power Supply and 10 MHz reference
- Backwards compatible with the CDM-500/CDM-550, CDM-550T and, CDM-600 and CDM-600L
- Interoperable with SDM-300A, SDM-300L3
- Ethernet M&C interface with Web browser, SNMP and Telnet
- IP Module option
- Vipersat Management System (VMS)
- 1:1 and 1:10 redundancy switches available

## FEATURE ENHANCEMENTS

Enhancing the modem's performance is easy. Additional features are added quickly on site, using FAST access codes purchased from Comtech EF Data. To enable these features, simply enter the code at the front panel.

## TURBO PRODUCT CODING

The CDM-570 offers all traditional FEC methods and incorporates an optional Turbo Product Codec (TPC). TPC is a FEC technique that delivers significant performance improvement when compared to Viterbi with concatenated Reed-Solomon. TPC simultaneously offers increased coding gain, lower decoding delay, and significant bandwidth savings.

The range of code rates offered spans Rate 5/16 through Rate 0.95, depending on modulation type.

## EDMAC OPERATION

A special feature of the CDM-570 is its ability to monitor and control the distant end of a satellite link using a Comtech EF Data proprietary overhead channel. This framed mode is called EDMAC (Embedded Distant-end Monitor And Control). User data is framed and extra bits are added to pass control, status, and Automatic Uplink Power Control information. This process is completely transparent to the user.

## REMOTE CONTROL

The operator may configure and monitor the modem from the front panel, or through the remote M&C port. Ten complete configurations may be stored in the modem. An Event log stores alarm and status information in non-volatile RAM, while the Link Statistics log stores link performance (Eb/No and AUPC performance) for Quality of Service (QoS) reporting purposes.

In addition to the traditional serial port M&C, the CDM-570 offers a 10/100BaseT Ethernet port for management functions. It incorporates a Web Server (HTTP), SNMP agent, and Telnet capability.

## IP MODULE AND VIPERSAT NETWORKS VMS

When configured with the IP Module, the CDM-570 provides advanced features for maximizing satellite link efficiency in IP networks.

Optionally, the CDM-570 Modem with IP module can be integrated with the Vipersat Management System (VMS) to provide a fully automated network and capacity management tool designed specifically for satellite networks. Read more about the IP Module and VMS capabilities on page 4.

# CDM-570 & CDM-570L Satellite Modems

## SYSTEM SPECIFICATIONS

| | |
|---|---|
| Frequency Range | CDM-570: 50 to 90 or 100 to 180 MHz,<br>CDM-570L: 950 to 1950 MHz,<br>100 Hz frequency resolution |
| Input/Output Impedance | CDM-570: 50 or 75Ω front panel selectable<br>CDM-570L: Transmit and Receive 50Ω, female Type N connector |
| Data Interfaces | EIA-422/-530, V.35, Sync EIA-232, G.703 T1, G.703 E1 balanced or unbalanced |
| Data Rate Range | |
| (1 bps programmable, and fully independent Tx and Rx rates) | |
| **Rate** | **Range** |
| 1/2 BPSK | 2.4 kbps to 1.5 Mbps |
| 1/2 QPSK/OQPSK | 4.8 kbps to 3.0 Mbps |
| 3/4 QPSK/OQPSK | 7.2 kbps to 4.5 Mbps |
| 7/8 QPSK/OQPSK | 8.4 kbps to 5.0 Mbps |
| 0.95 QPSK/OQPSK TPC | 9.1 kbps to 5.0 Mbps |
| 2/3 8-PSK TCM | 8.7 kbps to 4.4 Mbps |
| 3/4 8-PSK/8-QAM TPC | 10.8 kbps to 5 Mbps |
| 7/8 8-PSK/8-QAM TPC | 13.6 kbps to 5 Mbps |
| 7/8 16-QAM TPC | 16.8 kbps to 5 Mbps |
| Uncoded | 4.8 kbps to 5 Mbps |
| *(See the CDM-570 or CDM-570L manuals for details)* | |
| Scrambling | Mode dependent - ITU V.35, or proprietary externally synchronized |
| FEC Options | |
| Viterbi | Rate 1/2 BPSK, QPSK/OQPSK<br>Rate 3/4 and 7/8 QPSK/OQPSK and 16-QAM w/RS |
| Pragmatic TCM | 8-PSK 2/3<br>(Closed Network – Not IESS-310) |
| Turbo Product Coding | Rate 21/44 BPSK, 5/16 BPSK, Rate 1/2 QPSK/OQPSK<br>Rate 3/4 and Rate 7/8 QPSK/OQPSK, 8-PSK and 16-QAM<br>Rate 0.95 QPSK/OQPSK and 8-PSK |
| Reed-Solomon | Proprietary 220/200 and 200/180 modes available |
| Uncoded | BPSK, QPSK/OQPSK |
| M&C Interface | EIA-232, EIA-485 (2- or 4-wire), Ethernet 10/100 Base-T |
| Form C Relays | Tx, Rx traffic alarms and Unit faults |

## AVAILABLE OPTIONS

| **How Enabled** | **Option** |
|---|---|
| FAST | Variable Rate to 2.048 Mbps |
| FAST | Variable Rate to 5 Mbps |
| FAST | 8-PSK modulation |
| FAST | 16-QAM modulation |
| Hardware | Reed-Solomon Codec Board |
| Hardware | Turbo Codec Board |
| Hardware | CDM-570: Power Supply, AC Input |
| Hardware | CDM-570: Power Supply, -48 DC Input |
| Hardware | CDM-570L: Block Up Converter (BUC) 24 VDC, 100W power supply, AC Input or 48 VDC Input |
| Hardware | CDM-570L: Block Up Converter (BUC) 48 VDC, 180W power supply, AC Input or 48 VDC Input |
| Hardware | IP Module |
| | **IP Module Options**: |
| FAST | Header Compression |
| FAST | Payload Compression |
| FAST | Quality of Service (QoS) – 3 modes |
| FAST | 3x DES Data Encryption |
| VMS | Vipersat Management System Integration |

## ACCESSORIES

| | |
|---|---|
| CRS-170a | CDM-570L: 1:1 Modem Redundancy IF Switch |
| CRS-180 | CDM-570: 1:1 Modem Redundancy IF Switch |
| CRS-280 | CDM-570: IF Switch Module |
| CRS-300 | 1:N Modem Redundancy Switch |

## ENVIRONMENTAL AND PHYSICAL

| | |
|---|---|
| Temperature | Operating: 0 to 50ºC (32 to 122ºF)<br>Storage: -25 to 85ºC (-13 to 185ºF) |
| Power Supply | 100 to 240 volts AC, 50/60 Hz |
| Power Consumption (See Manual) | CDM-570: 29W typical (32W max) w/o IP Module<br>CDM-570L: 22W typical (32W max) w/o BUC or IP Module<br>PSU 250W maximum with 180W BUC PSU |
| Physical Dimensions | CDM-570: 1RU high, 12 inches deep (30.5cm)<br>CDM-570L: 1RU High, 16 inches deep (40.6 cm) |
| Weight | CDM-570: 7 lbs (3.2 kg)<br>CDM-570L: 16 lbs (7.2 kg) including 180W BUC supply |
| CE Mark | EMC, Safety (70/140 MHz)<br>EN55022 Class B (Emissions),<br>EN50082-1 Part 1 (Immunity)<br>EDM-570L: EN60950 (Safety) |
| FCC Approval | CDM-570L: FCC Part 15 Class B |

CDM-570 Satellite Modem Back Panel

CDM-570L Satellite Modem Back Panel

## DEMODULATOR

| | CDM-570 | CDM-570L |
|---|---|---|
| Input Power Range | -30 to -60 dBm | (-130 + 10 Log Symbol Rate) dBm minimum, (-90 + 10 Log Symbol Rate) dBm maximum |
| Max Composite Level | +35 dBc, up to -5 dBm | +43 dBc, up to -10 dBm |
| Acquisition Range | Normal mode: ± 1 to ± 32 kHz (1 kHz steps) | Normal mode: ± 1 to ± 32 kHz (1 kHz steps)<br>Wide mode: to ± 200, symbol rates above 625 ksps |
| Acquisition Time | Example: 200 ms average at 64 kbps Rate 1/2 QPSK, and ± 32 kHz acquisition range | |

## EXAMPLE BER PERFORMANCE

Met with two adjacent carriers 7 dB higher
Guaranteed $E_b/N_o$, in dB (Typical values in parentheses)

### Viterbi

| (B, QPSK/OQPSK) | 1/2 | 3/4 | 7/8 |
|---|---|---|---|
| $10^{-5}$ | 5.4 (4.9) | 6.8 (6.3) | 7.7 (7.2) |
| $10^{-7}$ | 6.7 (6.2) | 8.2 (7.7) | 9.0 (8.6) |

### Viterbi & Concatenated Reed-Solomon 220/200 or 200/180

| (B, QPSK/OQPSK) | 1/2 | 3/4 | 7/8 |
|---|---|---|---|
| $10^{-5}$ | 4.3 (4.0) | 5.6 (4.7) | 6.5 (6.0) |
| $10^{-7}$ | 4.5 (4.2) | 6.0 (5.2) | 6.9 (6.5) |

### Turbo Product Codec

| (QPSK/OQPSK) | 1/2 | 3/4 | 7/8 | 0.95 |
|---|---|---|---|---|
| $10^{-6}$ | 2.9 (2.6) | 3.8 (3.4) | 4.3 (4.0) | 6.4 (6.0) |
| $10^{-8}$ | 3.3 (2.8) | 4.4 (4.0) | 4.5 (4.2) | 6.9 (6.5) |
| (8-PSK) | 3/4 | 7/8 | 0.95 | |
| $10^{-6}$ | 6.2 (5.8) | 7.0 (6.6) | 9.3 (8.9) | |
| $10^{-8}$ | 6.8 (6.3) | 7.2 (6.8) | 10.3 (9.9) | |
| (8-QAM) | 3/4 | 7/8 | 0.95 | |
| $10^{-6}$ | 6.5 (6.1) | 6.6 (6.2) | 9.6 (9.2) | |
| $10^{-8}$ | 7.2 (6.8) | 6.8 (6.4) | 10.6(10.2) | |

### 8-PSK TCM/RS (Closed Network RS)

(See the CDM-570 manual for a complete listing of the performance of all FEC types, Code Rates, and Modulation types.)

| | |
|---|---|
| Receive Buffer | 512, 1024, 2048, 4096, 8182, or 16384 bits |
| Receive Clock Options | Rx Satellite, Tx Terrestrial, Internal Reference |
| Clock Tracking | ± 100 ppm minimum |
| External Reference Input | Female BNC connector 1, 2, 5, 10, or 20 MHz |
| Monitor Functions | $E_b/N_o$, Frequency Offset, BER, Buffer fill status, Rx signal level |

## MODULATOR

| | CDM-570 | CDM-570L |
|---|---|---|
| Frequency Stability | ±1 ppm, 0º to 50ºC (32º to 122ºF) | ±0.06 ppm, 0º to 50ºC (32º to 122ºF) |
| Output Power | 0 to –20 dBm, 0.1 dB steps | |
| Accuracy | ± 0.5 dB over frequency and temperature | ± 1.0 dB over frequency and temperature |
| Phase Noise | < 0.75 degrees RMS double-sided, 100 Hz to 1 MHz | < 1.2 degrees RMS double-sided, 100 Hz to 1 MHz |
| Output Spectrum/ Filtering | Meets IESS-308/-309 power spectral mask | |
| Harmonics and Spurious | < -55 dBc/4 kHz (Typically < -60 dBc/4 kHz) | |
| Transmit On/Off Ratio | 55 dB minimum | |
| External Tx Carrier Off | By TTL LOW signal, or RTS | |
| Tx Clock options | Internal (SCT), External (TT), Loop timing | |

## LOW-NOISE BLOCK CONVERTER (LNB) SUPPORT (CDM-570 Only)

| | |
|---|---|
| LNB Voltage | +13, +18, and +24 VDC @ 500 mA maximum |
| 10 MHz Reference Power Level | -3 dBm ± 3 dB via Rx center conductor |

## BLOCK UP CONVERTER (BUC) SUPPORT (CDM-570L Only)

| | |
|---|---|
| BUC Voltage | 24 VDC, 4A, 100W (internally fitted option)<br>48 VDC, 3A, 180W (internally fitted option) |
| 10 MHz Reference Power Level | -3 dBm ± 3 dB via Rx center conductor |
| FSK Support | Via Tx center conductor with FSK BUCs |

# IP Module & VMS Integration

## INTRODUCTION

With an innovative architecture to support IP networking, an IP-Module equipped CDM-570 and CDM-570L meets many customer requirements for Point-to-Point and Point-to-Multi-Point applications. When configured with the IP Module, the modems provide advanced features for improving satellite link efficiency in IP networks:

## STANDARD FEATURES

- easyConnect™ for set up with minimal configuration
- Static IP routing for unicast and multicast
- Powerful network management via SNMP, Web, or Telnet
- IGMP v1 and v2
- Symmetric as well as asymmetric operation for maximum bandwidth efficiency
- Point-to-Point or Point-to-Multi-Point configuration

## OPTIONAL FEATURES

- Header Compression (IP/TCP and IP/UDP/RTP)
- Payload Compression
- 3x DES Data Encryption
- Quality of Service (QoS)

## HEADER COMPRESSION OPTION

Configurable on a per route basis, header compression reduces the required Voice over Internet Protocol (VoIP) bandwidth by as much as 60%. Example: A G.729 voice codec, operating at 8 kbps, will occupy 32 kbps once encapsulated into IP framing on a LAN. Using IP/UDP/RTP Header Compression, the same traffic only needs 10.8 kbps total WAN satellite bandwidth to cross the link. Normal Web/HTTP traffic can be reduced an additional 10% via IP/TCP header compression.

## PAYLOAD COMPRESSION OPTION

Compressing payload reduces both the data frame size and satellite bandwidth required to transmit across the link. Configurable on a per route basis, Payload Compression optimizes traffic and reduces bandwidth up to 40%.

## DATA ENCRYPTION OPTION

The IP Module provides 3xDES data encryption to prevent unauthorized access to data over the satellite link, and is configurable on a per route basis.

## QUALITY OF SERVICE OPTION

The IP Module supports multi-level QoS to reduce jitter and latency for real time traffic, provides priority treatment to mission critical applications and allows non-critical traffic to use the remaining bandwidth. Three modes are available, Max/Priority, Min/Max and DiffServ.

- Max/Priority - Assign a maximum bandwidth that any traffic flow can utilize combined with 8 levels of prioritization
- Min/Max - Set the minimum and maximum bandwidth for user-defined classes of traffic to ensure that a certain level of bandwidth is always applied
- DiffServ – Provide higher priority to some applications over others; Industry-standard method of adding network-wide QoS enabling seamless co-existence in networks that already have DiffServ

## NETWORKING PROTOCOLS

| | |
|---|---|
| RFC 768 – UDP | RFC 2045 – MIME |
| RFC 791 – IP | RFC 2236 – IGMP v2 |
| RFC 792 – ICMP | RFC 2474 – Diffserv |
| RFC 793 – TCP | RFC 2475 – Diffserv |
| RFC 826 – ARP | RFC 2578 – SMI |
| RFC 856 – Telnet | RFC 2597 – AF PHB |
| RFC 862 – Ping | RFC 2598 – Expedite Forwarding |
| RFC 894 – IP | RFC 2616 – HTTP |
| RFC 959 – FTP | RFC 2821 – SMTP |
| RFC 1112 – IP Multicast | RFC 3412 – SNMP |
| RFC 1213 – SNMP MIB II | RFC 3416 – SNMPv2 |
| RFC 1812 – IPv4 Routers | RFC 3418 – SNMP MIB |

## OPERATIONS & MAINTENANCE

Configuration and management
- Console interface
- SNMP with MIB II and private, modem-specific MIB
- Telnet
- HTTP

Software/firmware (IP Module) upgrade via FTP
Traffic management statistics
Faults and alarms
Configuration backup and restoral

## SECURITY

Password Protection
Access List

## CONSOLE PORT

Interface EIA-232 (RJ-12 connector)

## REMOTE PORT

Interface EIA-232 or EIA-485 (2- or 4-wire)

## VMS NETWORK & BANDWIDTH MANAGEMENT

Vipersat Networks' VMS provides traditional monitor and control functions more efficiently than other M & C protocols, and allows enhanced capacity and bandwidth management capabilities for the modems. VMS gives satellite service providers and enterprise operators the ability to dynamically adjust bandwidth based on application, load or schedule.

VMS also allows the modems to switch from shared to dedicated mode. Inbound transmissions from remotes can be switched from a shared Selective Time Division Multiple Access (STDMA) mode to a dedicated Single Carrier Per Channel (SCPC) connection manually or automatically, triggered by application or load, or on a scheduled basis. This enables the network to more effectively handle connection-oriented applications and reduces both latency and network congestion. Through VMS, dynamic point-to-point mesh connections can be established between remotes. The result is an economical and flexible network, enabling bandwidth to be shared and directed where it is needed for any mix of IP voice, video or data traffic.

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